

# Appendix E: Redwood National Park CPP Monitoring Guide

Version

## Revision History Log:

Version #	Revision Date	Author	Changes Made	Reason for Change
1.00		Mathews, Gerst		

# ***Phenological Monitoring Guide: Redwood National Park***

A designated monitoring site of  
The California Phenology Project



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# I. Introduction to the California Phenology Project

*Phenology* is the study of the timing of seasonal biological events such as the flowering and fruiting of plants; the annual emergence of insect pollinators and pests; and the migration of birds and mammals. With funding from the National Park Service (NPS) Climate Change Response Program, the *California Phenology Project (CPP)*; [www.usanpn.org/cpp](http://www.usanpn.org/cpp) was launched in 2010 as a pilot project to develop and test protocols and to create tools and infrastructure to support long-term phenological monitoring and public education activities in California's national parks. On-the-ground pilot activities focused on seven California parks: Joshua Tree National Park (JOTR), Santa Monica Mountains National Recreation Area (SAMO), Golden Gate National Recreation Area (GOGA), John Muir National Historic Site (JOMU), Lassen Volcanic National Park (LAVO), Sequoia and Kings Canyon National Parks (SEKI), and Redwood National Park (REDW).

Products of the pilot period include a *Plant Phenology Monitoring Protocol* (with step-by-step instructions for conducting monitoring) and *park-specific monitoring guides* for each of the seven pilot parks. This monitoring guide is meant to serve as a reference for CPP participants who are observing plants at *Redwood National Park (REDW)*. It identifies and describes all of the CPP and USA-NPN resources that observers will need to get started monitoring plants at REDW (e.g., where are the REDW monitoring sites located, how to access USA-NPN datasheets, where to download CPP species profiles). It also covers all of the basic information that new NPS staff need to know about the CPP monitoring at their park. This guide, however, is not meant to replace participation in an official training event, nor is it meant to provide detailed background information about phenology and the USA-NPN monitoring protocols. Please refer to the *Plant Phenology Monitoring Protocol* for detailed monitoring instructions. For more information about the USA-NPN monitoring protocols, visit the USA-NPN's *How to Observe* webpage (<http://www.usanpn.org/how-observe>). To learn more about phenology, visit the CPP ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and USA-NPN websites ([www.usanpn.org](http://www.usanpn.org)), where you can download newsletters, project briefs, presentations, and more (<http://www.usanpn.org/cpp/resources>).

The goals of the *California Phenology Project* are to: (1) recruit and to train NPS staff in the Divisions of Resource Management, Education, and Interpretation; formal and informal educators; students; and the public in the skills needed for recording and interpreting phenological data; (2) establish baseline phenological patterns and track long-term phenological trends to document the effects of climate change on wild plants and animals; and (3) guide adaptive management of California's natural resources. For a detailed description of the CPP's scientific goals, please refer to the *Plant Phenology Monitoring Protocol*.

## II. Points of Contact

### Redwood National Park contacts:

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### Other CPP contacts:

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### III. CPP Species Monitored at REDW

There are 6 species targeted for phenological monitoring at Redwood National Park, three of which are monitored exclusively at REDW and three of which are also monitored at other parks (Table 1).

The two-sided CPP species profiles for each species are available for download from the CPP website (front and back images are also included below):

<http://www.usanpn.org/cpp/AllSpecies>. CPP species profiles include a brief description of each species, as well as photos for most phenophases. Please note that some profiles are missing photos of observed phenophases-- *we encourage CPP participants to continue collecting photos and updating the species profiles.*

Table 1. CPP species monitored in REDW, with their USA-NPN protocol category and the other National Parks where they are monitored.

Common Name	Scientific Name	USA-NPN Protocol Category	Parks
Common cowparsnip	<i>Heracleum maximum</i> (= <i>H. lanatum</i> )	Forbs Broadleaf Evergreen Trees & Shrubs	REDW; GOGA
Coyotebrush	<i>Baccharis pilularis</i>	(with pollen, no leaf buds)	REDW; GOGA; SAMO
Pacific trillium	<i>Trillium ovatum</i>	Forb	REDW
Red elderberry	<i>Sambucus racemosa</i>	Deciduous Trees & Shrubs	REDW; GOGA
Rhododendron	<i>Rhododendron macrophyllum</i>	Broadleaf Evergreen Trees & Shrubs	REDW
Silky beach pea	<i>Lathrys littoralis</i>	Forbs	REDW

(Abbreviations used: GOGA=Golden Gate National Recreation Area; SAMO=Santa Monica Mountains National Recreation Area)

A brief description of the species targeted for monitoring at REDW is provided below.

**3.1 Common cowparsnip (*Heracleum maximum*; HEMA)** is a perennial, herbaceous plant, with large, lobed broad leaves. It has thick, hairy stems. On an individual plant, the small white flowers either have both male and female parts or have only male parts; flowers are grouped into small clusters that are assembled into larger, showier, flat-topped clusters that resemble umbrellas. This is a type of compound inflorescence called an “umbel”. This species is phototoxic; when certain compounds are exposed to photons and come into contact with skin they react to cause a rash. Common cowparsnip was used by Native Americans for food and medicine; the toxic effects were reduced avoided by peeling the stalks, and selecting the youngest growth. A synonym for this species is *Heracleum lanatum*.

**3.2 Coyotebrush (*Baccharis pilularis*; BAPI)** is a shrub in the Aster family that is widespread and common in coastal California vegetation types. It is easy to identify, and not easily confused with other species. It flowers in the late summer through early winter, so it is

a nice choice for CPP participants who want to monitor at that time of the year. Coyotebrush is dioecious, and BAPI observations can be used to explore how dioecious species respond to climate change. It is also considered an important "nursery" plant to species palatable to deer (e.g., allows oaks to grow above the browse line when oaks "hide" in coyote brush). It is widespread in California's public lands (e.g., it is found in 10 National Park units and 19 UC Natural Reserves) and is currently monitored at Redwood National Park, John Muir NHS, Golden Gate NRA, and Santa Monica Mountains NRA.

**3.3 Pacific trillium (*Trillium ovatum*; TROV)** is an erect, perennial, herbaceous plant that reaches 10 and 50 cm in height. The dark green leaves appear in whorled triads above a bare stem. The showy, white flowers change to pink or maroon with age. TROV flowers are bisexual (i.e., they have both male and female parts) and occur as single flowers with three petals, emerging above the whorl of three leaves.

**3.4 Red elderberry (*Sambucus racemosa*; SARA)** is a deciduous shrub or small tree which can reach a height of 3-7 meters. Its green leaves have serrated edges and a strong, distinctive odor. The bark is dark reddish-brown with raised pores. The fragrant creamy-white flowers are arranged into dome-shaped clusters. The fruits are arranged in clusters of small, bright red, fleshy berries (when ripe).

**3.5 Rhododendron (*Rhododendron macrophyllum*; RHMA)** is a broadleaved evergreen shrub with grayish-brown bark. The thick leathery leaves are dark green and whorled at the tip of branches. The bell-shaped flowers are light to rose pink and 2-4 centimeters long; they are found in large loose clusters at the end of the branches. The fruit is a small brown five-parted capsule. Rhododendron has been the official flower of Washington State since 1892, chosen in a state-wide vote only open to women before the 1893 Chicago World Fair. The leaves, flowers and nectar of this species can be toxic to humans and livestock; honey made from the floral nectar has also been shown to be toxic. Flowers have been observed to be visited by bumblebees, syrphid flies, and butterflies.

**3.6 Silky Beach Pea (*Lathyrus littoralis*; LALI)** is a perennial herb in the pea family (Fabaceae). The leaves are silky grey and wooly, with 4 to 8 small overlapping leaflets. The purple-pink and white flowers have prominent, delicate venation. Flowers are found in tight clusters of 4 to 8 and are 15 to 18 mm wide. They are primarily pollinated by honeybees and bumblebee. The fruit is an oval hairy pea-like pod. The genus *Lathyrus* is large, with approximately 160 species distributed across the globe. The species name, *littoralis*, is from Latin, meaning "of the seashore". LALI has nitrogen fixing nodules on its roots.

Common cowparsnip, *Heracleum maximum* species profile (Version 2; March 2012):

California Phenology Project:  
species profile for  
**Common Cowparsnip**  
(*Heracleum maximum*)



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CPP site(s) where this species is monitored: Golden Gate National Recreation Area, Redwood National Park



Photo credit: Jerry Oldenettel (Flickr)

**What does this species look like?**

Common cow parsnip is a perennial, herbaceous plant growing 3 to 10 feet tall. The large broad leaves are lobed and it has thick, hairy stems. On an individual plant, the small white flowers either have both male and female parts or have only male parts. Flowers are grouped into small clusters that are assembled into larger, showier, flat-topped clusters that resemble umbrellas. This is a type of compound inflorescence called an "umbel".

When monitoring this species, use the USA-NPN **forbs** datasheet.

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**Species facts!**

- The CPP for letter code for this species is **HELA** (this species was formerly named *Heracleum lanatum*).
- In the carrot family, Apiaceae.
- This species is phototoxic; meaning when compounds are exposed to photons and come into contact with skin they react to cause a rash.
- Common cowparsnip was used by Native Americans for food and medicine; the toxic effects were reduced avoided by peeling the stalks, and selecting the youngest growth.



Photo credit: Jerry Oldenettel (Flickr)

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**Where is this species found?**

- In moist to semi-wet, well-drained soils.
- Prefers loam and sandy loam soils and clay and gravelly substrates.
- Found in woodlands, forest openings, grasslands, and riparian areas.
- Found at elevations less than 2900 meters (Note: according to the Jepson manual).




Photo credit: James Gaither (Flickr)


For more information about phenology and the California Phenology Project (CPP), please visit the CPP website ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and the USA-NPN website ([www.usanpn.org](http://www.usanpn.org))

Version 2, March 2012

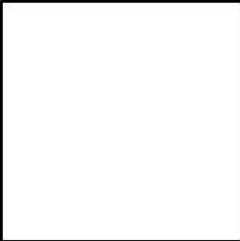
California Phenology Project:  
species profile for  
**Common Cowparsnip**  
(*Heracleum maximum*)




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**Initial growth**



Miguel Miera

**Leaves**


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Brian Haggerty

**Flowers or flower buds**

When monitoring flower or flower bud abundance for this species, count each inflorescence as a single flowering structure! For example, if there are two inflorescences with many flowers or buds each, then abundance should be recorded as <3.




Brian Haggerty

**Open flowers**

Each small flower typically has both male and female parts; many small flowers make up each cluster. Proportion of open flowers should be recorded at the scale of individual flowers, not inflorescences (i.e. count individual flowers!).

*Note: flower phenophases are nested; if you record Y for "open flowers" you should also record Y for "flowers or flower buds"*


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Stavon Krause

**Fruits**

The fruit is a tiny flattened capsule that changes from green to light-green, white, tan, or brown and displaying four conspicuous vertical purple lines.



Brian Haggerty

**Ripe fruits**

The fruit is ripe when it is dry and light-green, white, tan, or brown, and displaying four conspicuous vertical purple lines. **Note:** fruit phenophases are nested; if you record Y for "ripe fruits" you should also record Y to "fruits"

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Phenophases not pictured: **Recent fruit or seed drop**

Version 2, March 2012




Coyotebrush, *Baccharis pilularis* species profile (Version 3; April 2012):

California Phenology Project:  
species profile for  
**Coyotebrush**  
(*Baccharis pilularis*)



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**CPP site(s) where this species is monitored:** Golden Gate National Recreation Area, Redwood National Park, Santa Monica Mountains National Recreation Area




Photo credit: stonebird (Flickr)

**What does this species look like?**

This shrub can be up to three meters tall. The leaves are toothed, oval, and sticky. Coyotebrush is dioecious, meaning that each plant either produces flowers with only male parts or with only female parts. The male flowers produce yellow pollen and appear yellowish from a distance, and the female flowers produce fruit and are white. The flower heads appear round and disc-like.

*When monitoring this species, use the USA-NPN broadleaf evergreen (with pollen, no leaf buds) trees and shrubs datasheet.*

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**Species facts!**

- The CPP four letter code for this species is **BAPI**.
- BAPI is a member of the sunflower family (Asteraceae).
- This species arrives as a secondary pioneer species after fire or grazing.
- Baccharis* derives from the Greek word "bakkaris", referring to plants with fragrant roots, and *pilularis* refers to sticky globs on the flower buds.
- Native Americans used the heated leaves to reduce swelling, and the wood to make arrow shafts and houses.
- This species is an important nectar source for wasps, flies, and butterflies.




Photo credit: Jess Gambel

*insect gall (note: do not confuse galls for flower buds on this species!)*

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Photo credit: Jerry Kirkhart (Flickr)

**Where is this species found?**

- Found in many habitats including coastal bluffs and oak woodlands.
- Found from 0 to 750 meters elevation, but occasionally up to 1500 meters.
- This species is occasionally found on serpentine soil.


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For more information about phenology and the California Phenology Project (CPP), please visit the CPP website ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and the USA-NPN website ([www.usanpn.org](http://www.usanpn.org))


California Phenology Project:  
species profile for  
**Coyotebrush**  
(*Baccharis pilularis*)



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**Young leaves**  
Young leaves are generally thinner and lighter colored than mature leaves.  
Brian Haggerty



Crystal Anderson

*The flowers pictured to the left have only male parts (anthers) and will not produce fruit.*



Crystal Anderson

*The flowers pictured to the right have only female parts and will produce fruit. Each flower may produce a single seed.*




**Flowers or flower buds**  
When monitoring flower and flower bud abundance for this species, count each inflorescence as a single flowering structure! For example, if there are two inflorescences with many flowers or buds each, then abundance should be recorded as <3.

Miguel Viera



Steven Krause

*BAPI flower buds; Do not mistake for a gall (pictured on the front)*



Steven Krause


**Open flowers**  
Can you see the anthers or stigma? Proportion of open flowers should be recorded at the scale of individual flowers, not inflorescences (i.e. count individual flowers!)

*Note: USA-NPN flower phenophases are nested; if you record Y for "open flowers" you should also record Y for "flowers or flower buds"*



Crystal Anderson

**Fruits**  
The fruit is a tiny, one-seeded capsule tipped with a tuft of white hairs. Fruits are grouped in a seed head and change from yellow-green to tan or light brown as they ripen. When fully dry, the fruits are blown from the plant.



Steven Krause

**Ripe fruits**  
The fruit is considered ripe when it is tan or light brown.  
*Note: fruit phenophases are nested; if you record Y for "ripe fruits" you should also record Y to "fruits"*

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**Phenophases not pictured: Pollen release, Recent fruit or seed drop**

Version 3, April 2012


Version 3, April 2012

**Pacific trillium, *Trillium ovatum* species profile (Version 2, March 2012):**

**California Phenology Project:  
species profile for  
Pacific Trillium  
(*Trillium ovatum*)**



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**CPP site(s) where this species is monitored:** Redwood National Park

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Photo credit: David Hofmann (Flickr)

**What does this species look like?**  
Pacific trillium is an erect, perennial, herbaceous plant that reaches 10 and 50 cm in height. The dark green leaves appear in whorled triads above a bare stem. The showy, white flowers change to pink or maroon with age. Flowers are bisexual; they have both male and female parts. They occur as single flowers with three petals, emerging above a whorl of three leaves.

*When monitoring this species, use the USA-NPN forbs datasheet.*

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**Species facts!**

- The CPP four letter code for this species is **TROV**.
- A very slow-developing long-lived plant; can take up to 7 years to flower.
- Pollinated primarily by beetles, moths, and bumblebees.
- Can spread clonally through underground rhizomes.
- Seeds are dispersed by ants and wasps.
- The roots have been used for medicinal purposes.




Photo credit: Steven Krause

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**Where is this species found?**

- Grows in partially shaded to shaded sites, in moist to wet sites, along stream banks, and areas that are bog-like in the Spring.
- Found in Redwood and mixed-evergreen forest on moist wooded slopes.
- Occurs from 10 to 2000 meters in elevation.





Photo credit: OutdoorPDK (Flickr)

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For more information about phenology and the California Phenology Project (CPP), please visit the CPP website ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and the USA-NPN website ([www.usanpn.org](http://www.usanpn.org))

Version 2, March 2012


**California Phenology Project:  
species profile for  
Pacific Trillium  
(*Trillium ovatum*)**



**UCSB**




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Steven Krause

**Initial growth**




Brian Haggerty

**Leaves**  
Leaves occur in whorls of three. They have no stalks (petioles) at their bases.




Brian Haggerty

**Flowers or flower buds**  
Only one flower will be present on a single plant at any given time!  
**Note: You will only monitor the flower abundance if you are monitoring this species as a patch.**



Brian Haggerty

**Open flower**  
Each flower has both male and female parts.  
**Note: flower phenophases are nested; if you record Y for "open flowers," you should also record Y for "flowers or flower buds"**



Steven Krause

**Fruits**  
The fruit is a fleshy capsule and changes from green to yellow or yellow-green, and falls from the plant when ripe, releasing its seeds.

**Ripe fruits**  
The fruit is considered ripe when it separates and readily falls from the plant. When touched.  
**Note: fruit phenophases are nested; if you record Y for "ripe fruits," you should also record Y to "fruits"**

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Phenophases not pictured: **Recent fruit or seed drop**

Version 2, March 2012

## Red elderberry, *Sambucus racemosa* (Version 3, April 2013):

California Phenology Project:  
species profile for  
**Red Elderberry**  
(*Sambucus racemosa*)



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National Phenology Network



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SERVICE

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CPP site(s) where this species is monitored: Redwood National Park




Photo credit: David Hoffmann (Flickr)

**What does this species look like?**

This species is a deciduous perennial shrub or small tree which can reach a height of 3-7 meters. Its green leaves have serrated edges and a strong, distinctive odor. The bark is dark reddish-brown with raised pores. The fragrant creamy-white flowers are arranged into dome-shaped clusters. The fruits are arranged in clusters of small, bright red, fleshy berries.

When monitoring this species, use the **USA-NPN deciduous trees and shrubs** datasheet.

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**Species facts!**

- The CPP four letter code for this species is **SARA**.
- Native Americans used the fruits and bark medicinally.
- The fruits were used for seasoning in food, soups, and other dishes. They were eaten fresh as well as cooked to make jellies and jams; fruits were also used to make wine.
- Flowers can be either wind- or insect-pollinated.
- Seeds require fire, passage through animal guts, or stratification (alternating periods of cold and warmth) to break dormancy.



Photo credit: James Gaither (Flickr)

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Photo credit: Walter Siegmund

**Where is this species found?**


- Occurs in riparian areas; found along streambanks, ravines, swamps, savannahs, wet meadows, and woodlands.
- Found in moist conifer forests; frequently associated with red alder.
- Grows best in deep loamy soil with good drainage.

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Version 3, April 2013


California Phenology Project:  
species profile for  
**Red Elderberry**  
(*Sambucus racemosa*)



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Breaking leaf buds




Leaves




Born1945

**Flowers or flower buds**  
When monitoring flower or flower bud abundance for this species, count each inflorescence as a single flowering structure! For example, if there are two inflorescences with many flowers or buds each, then abundance should be recorded as <3.




Steven Krause

**Open flowers**  
Can you see the stigma and anthers within the flowers? **Proportion of open flowers** should be recorded at the scale of individual flowers, not inflorescences (i.e. count individual flowers)!  
**Note:** flower phenophases are nested; if you record Y for "open flowers" you should also record Y to "flowers or flower buds"



Steven Krause

**Fruits**  
The fruit is berry-like and usually changes from green to red or, rarely, to yellow or white, or red to purple-black; it falls from the plant when ripe.



Steven Krause

**Ripe fruits**  
Generally, the fruit is ripe when it is red or, rarely, depending on the variety, yellow white or purple-black. **Note:** fruit phenophases are nested; if you record Y for "ripe fruits" you should also record Y to "fruits"

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Phenophases not pictured: Increasing leaf size, Colored leaves, **Falling leaves and Recent fruit or seed drop**


Version 3, April 2013

Rhododendron, *Rhododendron macrophyllum* (Version 2; March 2012) :

California Phenology Project:  
species profile for  
**Pacific Rhododendron**  
(*Rhododendron macrophyllum*)

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NATIONAL PARK SERVICE

CPP site(s) where this species is monitored: Redwood National Park



**What does this species look like?**  
This species is a broadleaved evergreen shrub with grayish-brown bark. The thick leathery leaves are dark green and whorled at the tip of branches. The bell-shaped flowers are light to rose pink and 2-4 centimeters long. They are found in large loose clusters at the end of the branches. The fruit is a small brown five-parted capsule.

When monitoring this species, use the USA-NPN **broadleaf evergreen trees and shrubs** datasheet.

**Species facts!**

- The CPP four letter code for this species is RHMA.
- This has been the official flower of Washington State since 1892, chosen in a state-wide vote only open to women before the 1893 Chicago World Fair.
- The leaves, flowers and nectar of this species can be toxic to humans and livestock. Honey made from the floral nectar has also been shown to be toxic.
- Flowers have been observed to be visited by bumblebees, syrphid flies, and butterflies.




Photo credit: Stassia Samuels

**Where is this species found?**

- Found along the Pacific coast, between Monterey County and British Columbia.
- Occurs in moist coniferous forests.
- Found at elevations less than 1100 meters.
- Thrives in disturbed habitats.





Photo credit: Stassia Samuels

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Version 2, March 2012

California Phenology Project:  
species profile for  
**Pacific Rhododendron**  
(*Rhododendron macrophyllum*)


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**Breaking leaf buds**  
This phenophase can be difficult to identify; remember, you can circle ? if you are unsure of what you are seeing!  
Brian Haggerty



**Young leaves**  
Young leaves tend to be brighter in color and thinner than mature leaves  
Brian Haggerty




**Flowers or flower buds**  
When monitoring flower or flower bud abundance for this species, count each inflorescence as a single flowering structure! For example, if there are two inflorescences with many flowers or buds each, then abundance should be recorded as <3.  
Brian Haggerty




**Open flowers**  
Each flower has both male and female parts. Proportion of open flowers should be recorded at the scale of individual flowers, not inflorescences (i.e. count individual flowers)!  
Stassia Samuels

**Note:** flower phenophases are nested; if you record Y for "open flowers" you should also record Y to "flowers or flower buds"



**Fruits**  
A fruit is a woody capsule that changes from green to rusty brown, and splits open to expose the seeds when ripe.  
Steven Krause




**Ripe fruits**  
The fruit is considered ripe when it is dry and splits open to expose the seeds. **Note:** fruit phenophases are nested; if you record Y for "ripe fruits" you should also record Y to "fruits"  
Stassia Samuels

Phenophases not picture: **Recent fruit or seed drop**


Version 2, March 2012

## Silky Beach Pea, *Lathyrus littoralis* (Version 2; March2012):


California Phenology Project:  
species profile for  
**Silky Beach Pea**  
(*Lathyrus littoralis*)



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CPP site(s) where this species is monitored: Redwood National Park




Photo credit: Gordon Leppig & Andrea J. Pickart

**What does this species look like?**

This species is a perennial herb with silky grey woolly leaves. The leaves have 4 to 8 small overlapping leaflets. The purple-pink and white flowers have prominent delicate venation. Flowers are found in tight clusters of 4 to 8 and are 15 to 18 millimeters wide. The fruit is an oval hairy pea-like pod.

When monitoring this species, use the USA-NPN *forbs* datasheet.

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**Species facts!**

- The CPP four letter code for this species is **LALI**.
- A member of the legume, or pea family.
- The genus *Lathyrus* is large, with approximately 160 species, and found all over the globe.
- The species name, *littoralis*, is from Latin, meaning "of the seashore".
- Has nitrogen fixing nodules on its roots.
- Primarily pollinated by honeybees and bumblebees.




Photo credit: Brian Haggerty

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Photo credit: David Hoffman (Flickr)

**Where is this species found?**

- Found on beaches and open coastal dunes.
- It is distributed along the coastline from California to British Columbia.
- Occurs at elevations less than 5 meters.

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California Phenology Project:  
species profile for  
**Silky Beach Pea**  
(*Lathyrus littoralis*)



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Steven Krause

**Initial growth**



Brian Haggerty

**Leaves**

Each leaf is divided into smaller leaflets.



Brian Haggerty

**Flowers or flower buds**

When monitoring flower or flower bud abundance for this species, count each inflorescence as a single flowering structure! For example, if there are two inflorescences with many flowers or buds each, then abundance should be recorded as <3.



Brian Haggerty

**Open flowers**

The anthers and stigmas are enclosed by the folded petals, so it can be difficult to see the reproductive parts in the open flowers of this species. Proportion of open flowers should be recorded at the scale of individual flowers, not inflorescences (i.e. count the individual flowers)!

**Note:** flower phenophases are nested; if you record Y for "open flowers" you should also record Y for "flowers or flower buds"



Brian Haggerty

**Fruits**

A fruit is a hairy pod that changes from green to tan, light brown or light reddish brown, and then splits open when ripe.

**Ripe fruits**

The fruit is ripe when it is dry and splits open.

**Note:** fruit phenophases are nested; if you record Y for "ripe fruits" you should also record Y to "fruits"

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**Phenophases not pictured: Recent fruit or seed drop**

Version 2, March 2012

## IV. REDW Monitoring Locations and Maps

The CPP has established three monitoring locations at Redwood National Park: Kuchel Visitor Center, Lady Bird Johnson Grove, and Crescent Beach Overlook (Table 2; Figure 1). Maps for each monitoring site are available at: <http://www.usanpn.org/cpp/REDW/maps>

Table 2. REDW monitoring locations, target plant species at each location (with number of targeted individuals), and the approximate phenologically active season for each phenophase category at each location. Estimates of the phenologically active season at each location are based on observations recorded in 2012 and should be revised as additional years are represented in the dataset.

	Location (4-letter code)	Target Species (# of individuals)	Year monitoring initiated	Approximate Phenologically Active Season
(1)	Kuchel Visitor Center (KVC)	<i>Baccharis pilularis</i> (9)	2011	Leaves: TBD <sup>1</sup> Flowers: July-TBD <sup>1</sup> Fruit: TBD <sup>1</sup>
		<i>Lathyrus littoralis</i> <sup>2</sup>	2011	Leaves: TBD <sup>1</sup> Flowers: April-June Fruit: May-August
(2)	Lady Bird Johnson Grove (LBJ)	<i>Rhododendron macrophyllum</i> (18)	2011	Leaves: May-September Flowers: TBD <sup>1</sup> Fruit: July-November
		<i>Trillium ovatum</i> (23)	2011	Leaves: TBD <sup>1</sup> Flowers: March-May Fruit: May-October
(3)	Crescent Beach Overlook (CBO)	<i>Baccharis pilularis</i> (9)	2011	Leaves: TBD <sup>1</sup> Flowers: TBD <sup>1</sup> Fruit: TBD <sup>1</sup>
		<i>Heracleum maximum</i> (21)	2011	Leaves: TBD <sup>1</sup> Flowers: April-October Fruit: May-October
		<i>Sambucus racemosa</i> (9)	2011	Leaves: TBD <sup>1</sup> Flowers: TBD <sup>1</sup> Fruit: April-October

<sup>1</sup>the *phenologically active season* of species for which a full calendar year of observations were not available are labeled as TBD (to be determined).

<sup>2</sup>LALI is monitored using patch-monitoring protocols.

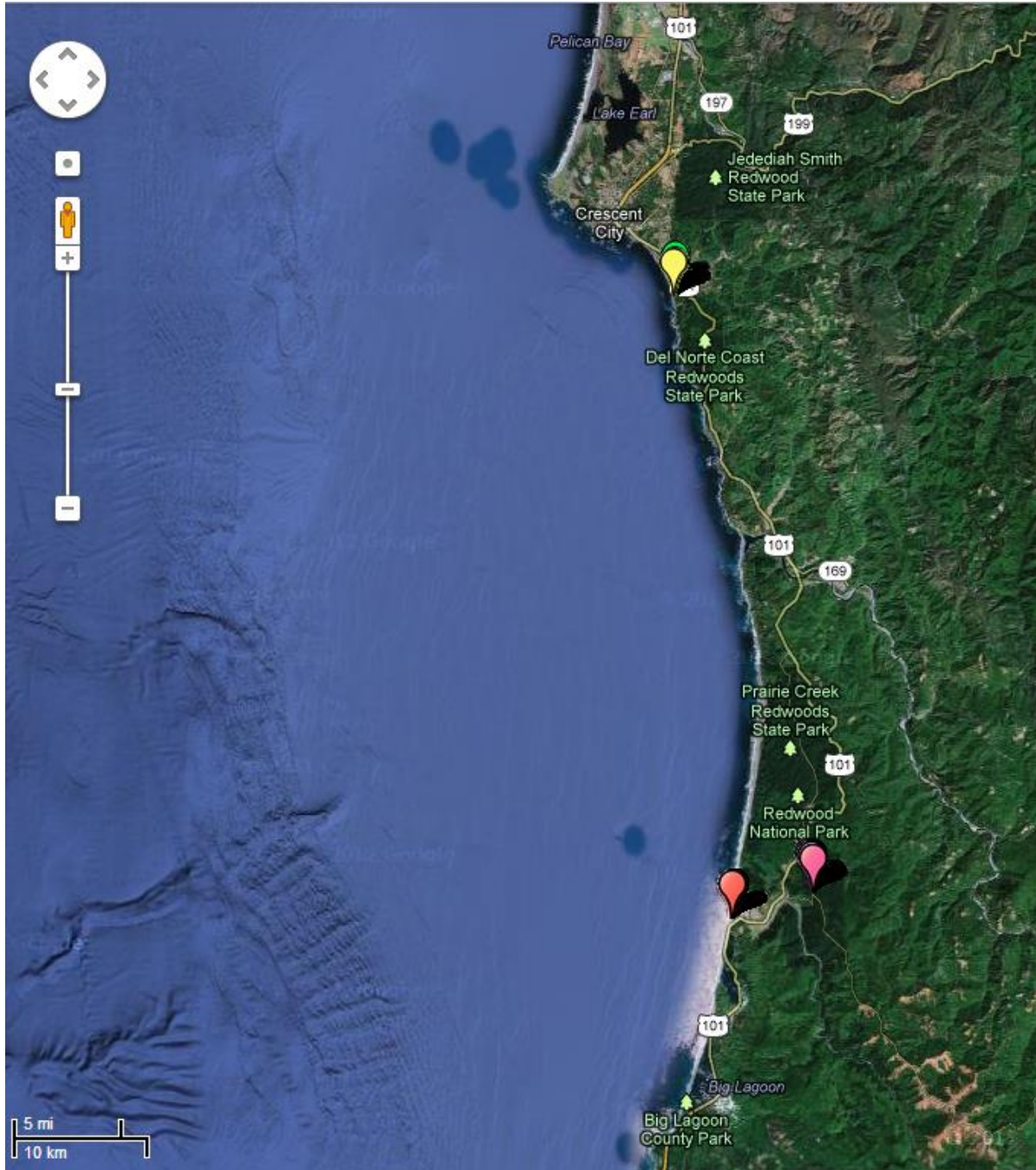


Figure 2. REDW monitoring locations labeled by their four letter codes (see Table 2 and the text below).

A spreadsheet with GPS coordinates for each targeted plant is available on the CPP website (<http://www.usanpn.org/cpp/REDW/maps>). Coordinates are provided in three formats: UTM's, latitude-longitude, and decimal degrees; the datum for all coordinates is WGS84. The identifier code for each plant follows the same format:

CPP-PARK-LOCA#-GESP#.

LOCA# represents the location name in a three letter code (e.g., Ladybird Johnson Trail = LBJ) and the site at each location (e.g., site 2 at Ladybird Johnson Trail= LBJ2).  
GESP# represents the four letter code for each genus species combination (e.g. *Trillium ovatum* = TROV) and the individual plant number at each site (e.g. the third *Trillium ovatum* = TROV3).  
So, the whole identifier for the third Pacific trillium at Ladybird Johnson Trail would be: CPP-REDW-LBJ2-TROV3

Photographs of *some* targeted plants are available for the REDW sites via *Nature's Notebook* (<http://www.nn.usanpn.org>). To view plant photos, you must have access to the REDW network sites in your *Nature's Notebook* account.



4.1 The **Kuchel Visitor Center** sites are located near the mouth of Redwood Creek. *Lathyrus littoralis* is monitored in patches on the dunes, while *Baccharis pilularis* is tagged in the backdune. A first-person perspective guide for these monitoring sites is available for download from the CPP website (<https://www.usanpn.org/cpp/REDW/maps>).

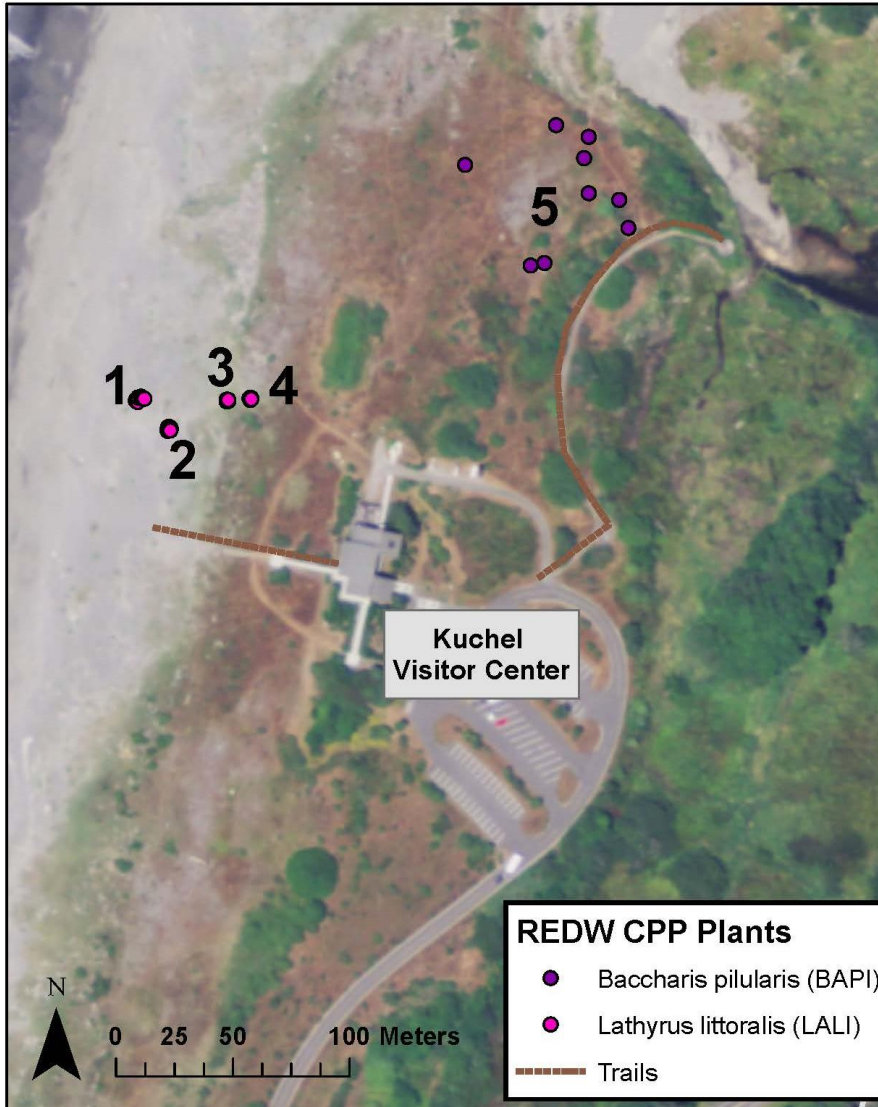


Figure 3. KVC monitoring sites (this map is also available for download on the CPP website).

4.2 The **Lady Bird Johnson Grove** sites are distributed along the 1.4 mile Lady Bird Johnson Grove Nature Trail. Rhododendron and Pacific trillium are monitored on this trail (Table 2). A first-person perspective guide for these monitoring sites is available for download from the CPP website (<https://www.usanpn.org/cpp/REDW/maps>).

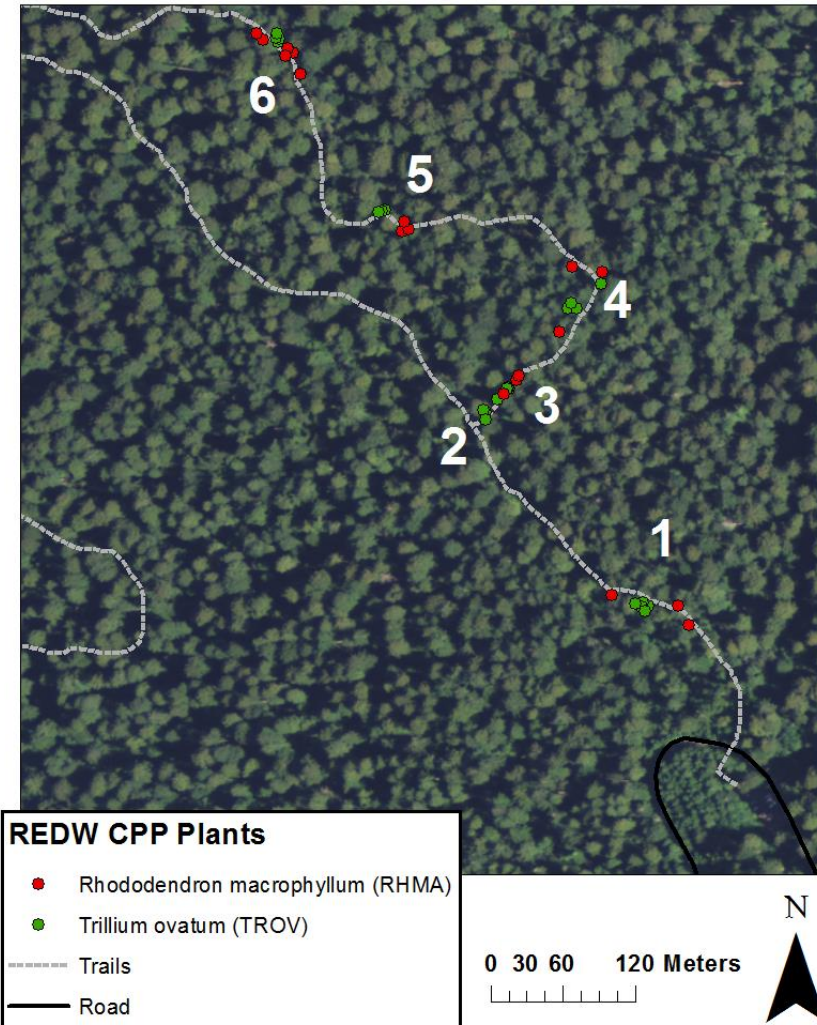


Figure 4. LBJ monitoring sites (this map is also available for download on the CPP website).

4.3 The **Crescent Beach Overlook** sites are located along the Coastal Trail between Crescent Beach Overlook and Crescent Beach (west of Enderts Beach Road). A first-person perspective guide for these monitoring sites is available for download from the CPP website (<https://www.usanpn.org/cpp/REDW/maps>).

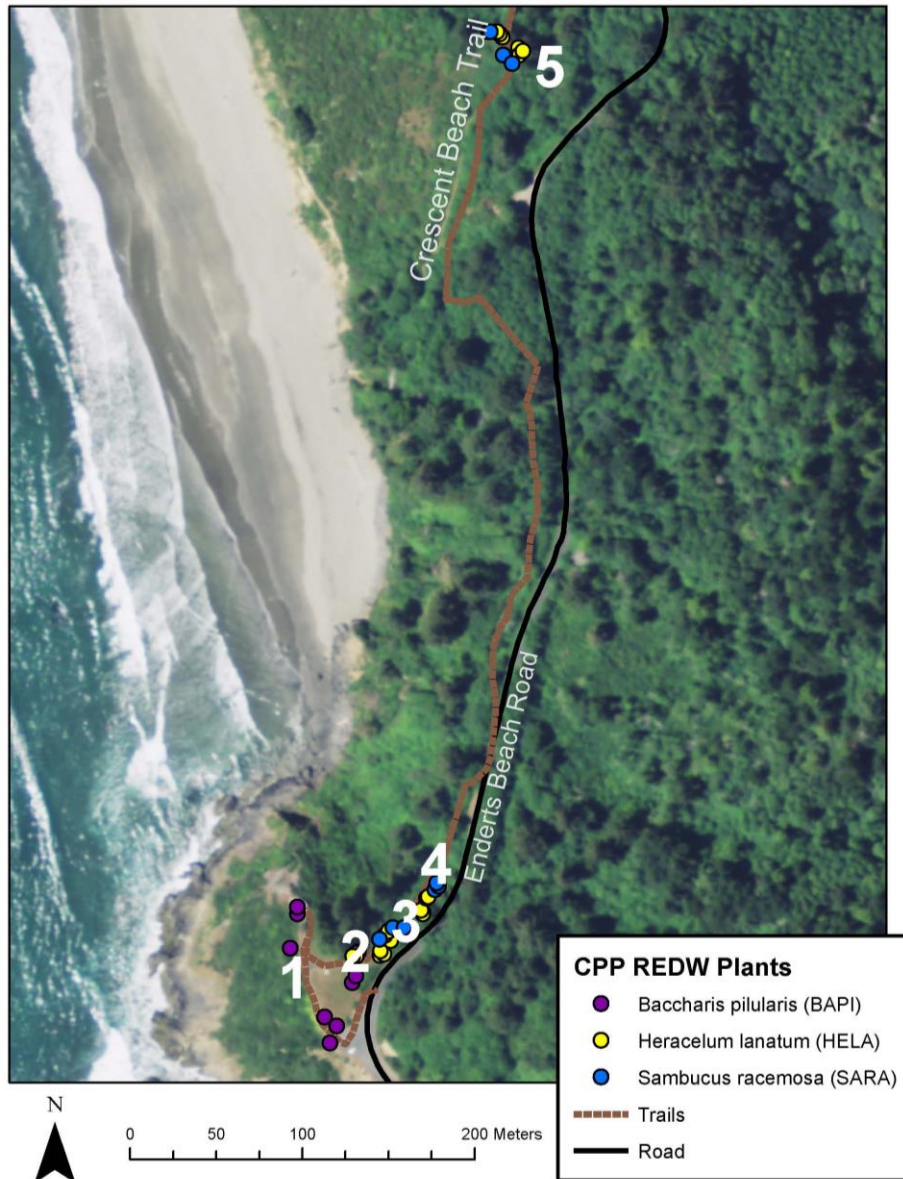


Figure 5. CBO monitoring sites (this map is also available for download on the CPP website).

## **V. Frequency of monitoring and estimated time investment**

As described in detail in the *CPP Plant Phenology Monitoring Protocol*, plants should be monitored *at least* twice weekly to accurately detect changes in the onset and duration of phenophases. More frequent monitoring will maximize the ability to detect and to measure phenological change, although some CPP monitoring sites may be established primarily for interpretive purposes and monitored less frequently.

Although data entry is not time-sensitive, uploading observations to *Nature's Notebook* at least 4 times a year will minimize a back-log of data entry. Entering data more frequently (e.g., after each monitoring event or at the end of every week), however, is helpful in preventing confusion or correcting observation errors on the datasheets, since observers may remember the monitoring events well enough to correct errors during data-entry.

It is best to have only a small number of well-trained observers monitoring a site. Novices tend to interpret phenophase abundances or “quantities” differently, and if there are many observers with little experience recording abundance estimates, percentages and quantities may be estimated inconsistently on the data sheets.

## VI. Datasheets and Data Entry

Datasheets for all CPP species can be downloaded from the CPP website on the individual species pages (direct links to the datasheets are provided below) or from the USA-NPN website ([www.usanpn.org](http://www.usanpn.org)). See *Phenology Site and Trail Monitoring SOP #6* for additional instructions for downloading and using USA-NPN datasheets.

### Direct links to datasheets for REDW species:

[Common cowparsnip, \*Heracleum maximum\*](#)

[Coyotebrush, \*Baccharis pilularis\*](#)

[Pacific trillium, \*Trillium ovatum\*](#)

[Red elderberry, \*Sambucus racemosa\*](#)

[Rhododendron, \*Rhododendron macrophyllum\*](#)

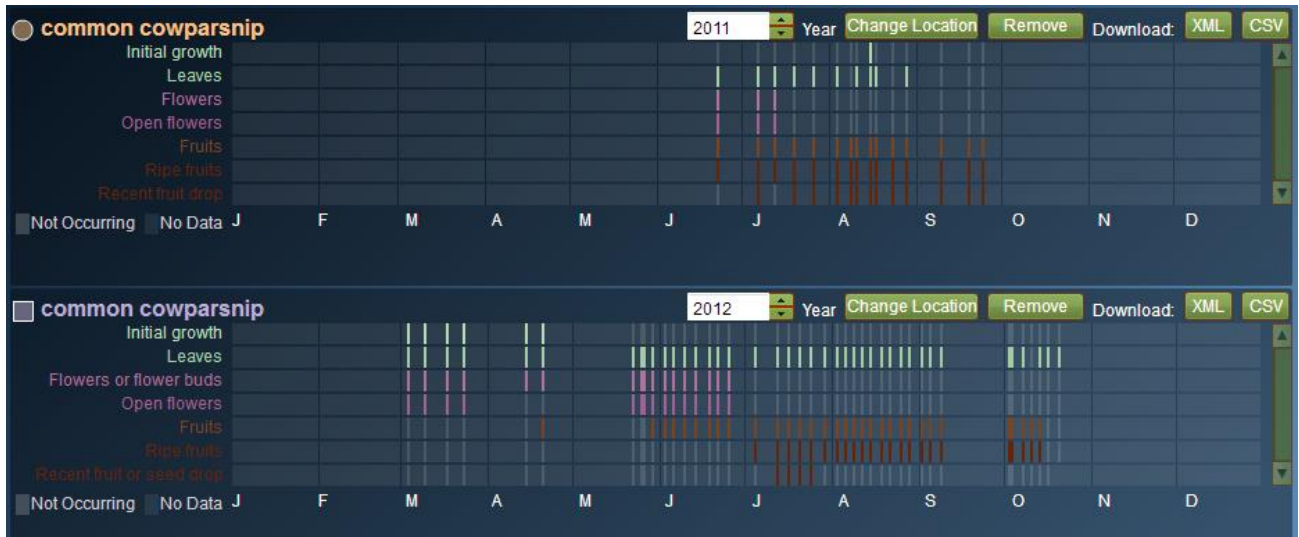
[Silky beach pea, \*Lathyrus littoralis\*](#)

Step-by-step instructions for data entry into the National Phenology Database (NPDb) curated by the USA-NPN are provided in *Data Entry and Data Management SOP # 7*.

## VII. Preliminary Phenological Calendars for REDW focal taxa: estimates of phenophase onset and duration

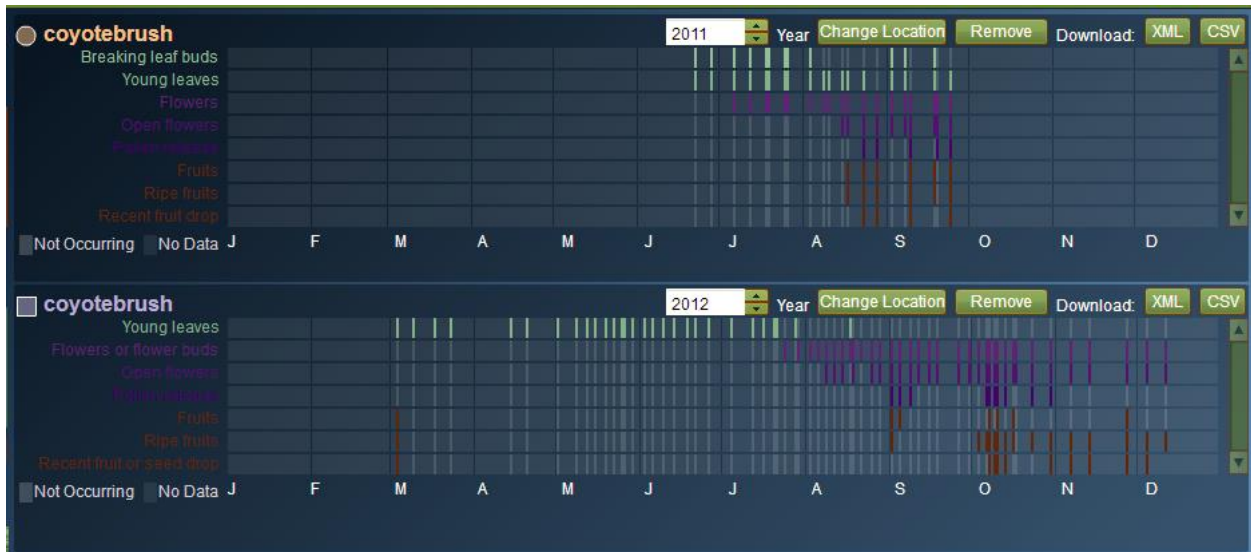
(1) **Common cowparsnip**: 2011 and 2012 observations are summarized in the USA-NPN visualization tool below. Based on these preliminary data summaries, estimates the phenologically active season (at REDW) for common cowparsnip phenophases are:

- *initial growth*: TBD
- *leaves*: TBD
- *flowers or flower buds*: TBD
- *open flowers*: TBD
- *fruits*: May-October
- *ripe fruits*: July-October
- *recent fruit drop*: July-October



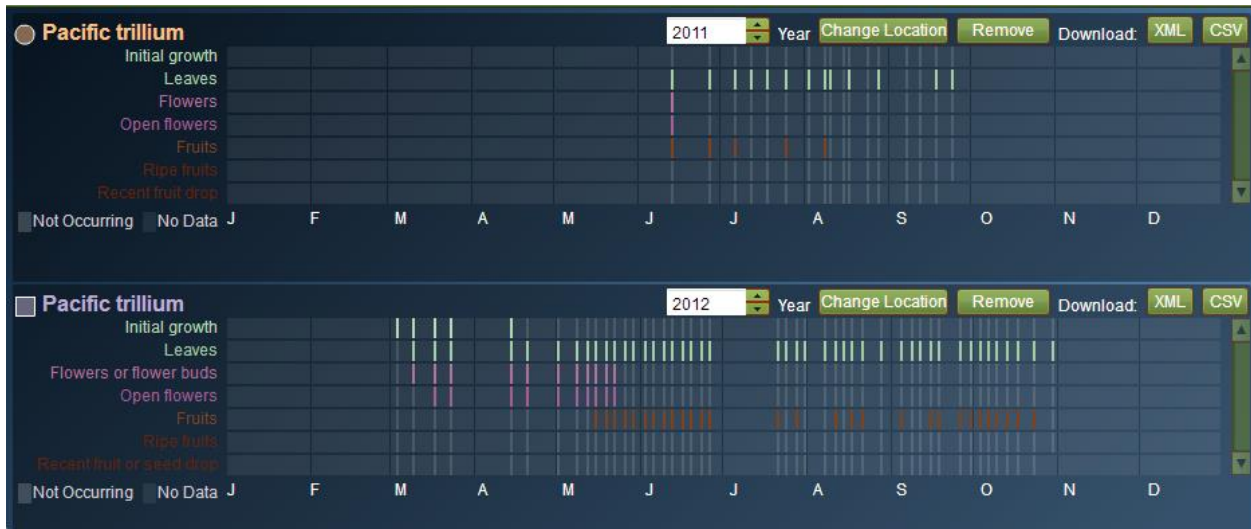
(2) **Coyotebrush:** 2011 and 2012 observations are summarized in the USA-NPN visualization tool below. Based on these preliminary data summaries, estimates the phenologically active season (at REDW) for coyotebrush phenophases are:

- *breaking leaf buds:* TBD
- *young leaves:* TBD
- *flowers or flower buds:* June-TBD
- *open flowers:* August-TBD
- *fruits:* August-TBD
- *ripe fruits:* August-TBD
- *recent fruit drop:* August-TBD



(3) **Pacific trillium:** 2011 and 2012 observations are summarized in the USA-NPN visualization tool below. Based on these preliminary data summaries, estimates the phenologically active season (at REDW) for pacific trillium phenophases are:

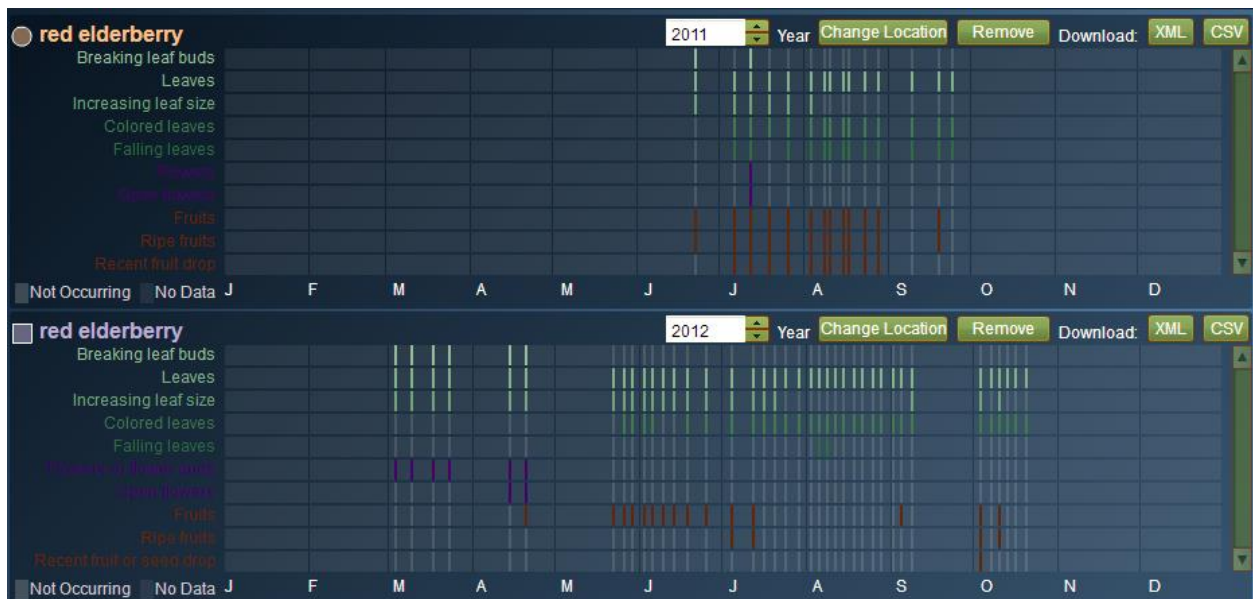
- *initial growth:* TBD
- *leaves:* TBD
- *flowers or flower buds:* March-May
- *open flowers:* March-May
- *fruits:* May-October
- *ripe fruits:* TBD
- *recent fruit drop:* TBD





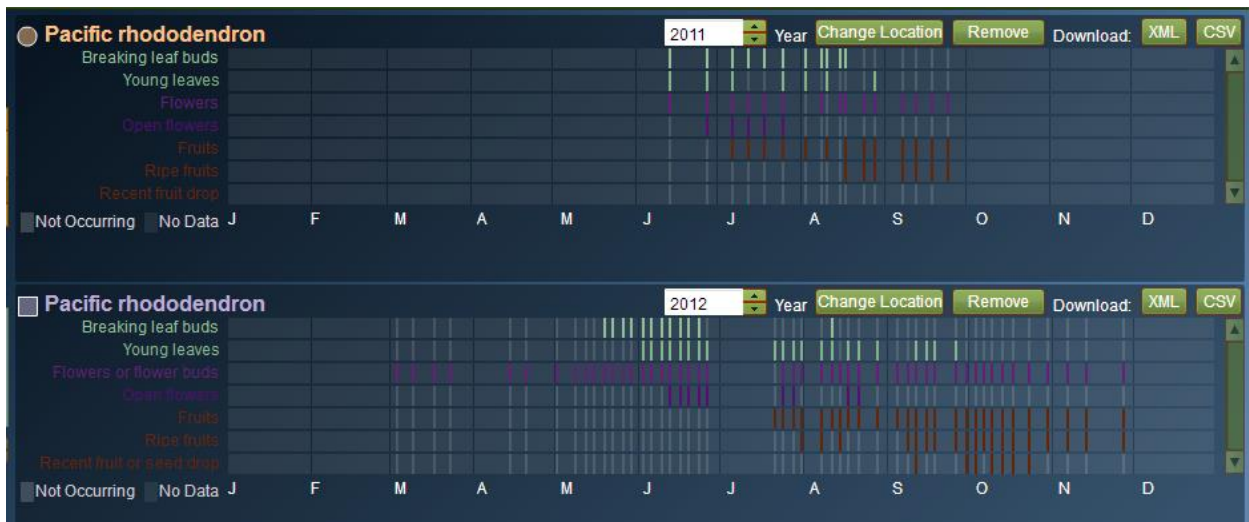
(4) **Red elderberry:** 2011 and 2012 observations are summarized in the USA-NPN visualization tool below. Based on these preliminary data summaries, estimates the phenologically active season (at REDW) for red elderberry phenophases are:

- *breaking leaf buds:* TBD
- *leaves:* TBD
- *increasing leaf size:* TBD
- *colored leaves:* May-TBD
- *falling leaves:* TBD
- *flowers or flower buds:* March-May
- *open flowers:* March-May
- *fruits:* April-October
- *ripe fruits:* June-October
- *recent fruit drop:* June-October



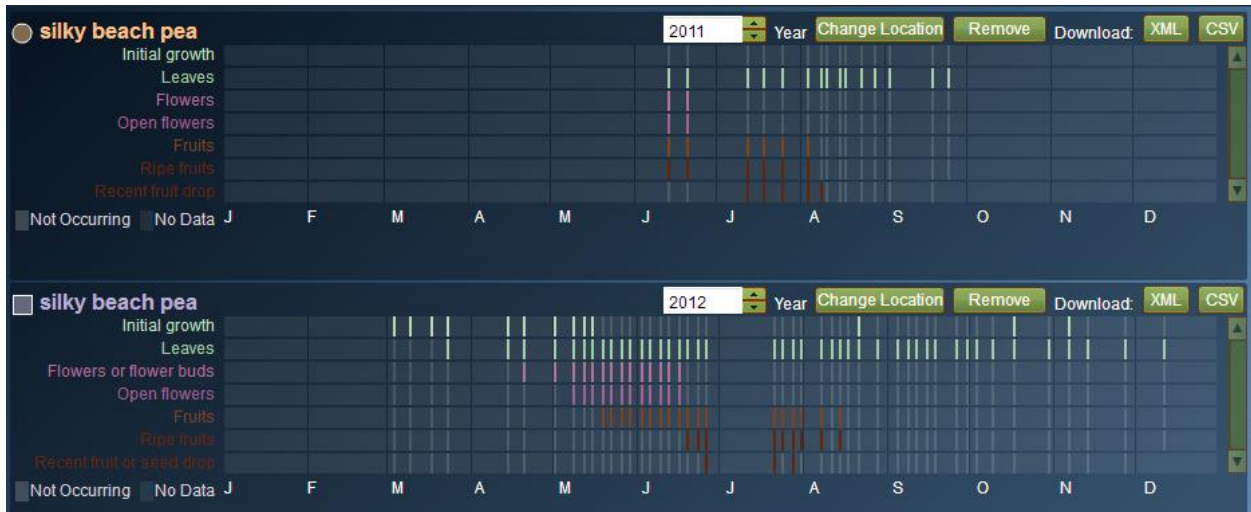
(5) **Rhododendron:** 2011 and 2012 observations are summarized in the USA-NPN visualization tool below. Based on these preliminary data summaries, estimates the phenologically active season (at REDW) for rhododendron are:

- *breaking leaf buds:* May-August
- *young leaves:* June-October
- *flowers or flower buds:* TBD
- *open flowers:* June-August
- *fruits:* July-TBD
- *ripe fruits:* July-TBD
- *recent fruit drop:* September-October



(6) **Silky beach pea:** 2011 and 2012 observations are summarized in the USA-NPN visualization tool below. Based on these preliminary data summaries, estimates the phenologically active season (at REDW) for silky beach pea are:

- *initial growth:* TBD
- *leaves:* March-TBD
- *flowers or flower buds:* April-June
- *open flowers:* May-June
- *fruits:* May-August
- *ripe fruits:* June-August
- *recent fruit drop:* June-August



## **VIII. Suggestions for Interpretative Programs for the Public**

The CPP has developed a variety of educational and interpretive programs that can be downloaded from the *Education* page on the CPP website (<http://www.usanpn.org/cpp/education>). Whether you're looking for a simple hands-on activity for the backyard or schoolyard, or you're in need of a guide to plan, install, and use a phenology garden for year-round scientific and educational activities, you'll find over 25 phenology-focused resources on the *Education* page. These resources are designed by CPP scientists and educators for a variety of ages and scientific abilities.

The CPP Interpretive Guide is also available for download on the website on the *Resources* page (<http://www.usanpn.org/cpp/resources>). We expect this guide will help park interpreters and educators to introduce the CPP to park visitors. This guide also provides suggestions for ways in which — through hands-on activities — park staff can help visitors to learn how park scientists and volunteers are detecting the effects of environmental variation and climate change on the seasonal cycles of plants and animals.